

Application No. 10/674455
Amendment Dated September 12, 2006
Reply to the Office Action dated April 19, 2006

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Remarks

Claims 20-27 of the application are pending.

Claims 20-27 stand rejected.

Claims 20 and 21 have been amended.

Claims 20-27 are presented herein for further review on the merits.

No new matter has been added.

In the Office Action, the Examiner has rejected claims 20-21 and 25-27 under 35 U.S.C. § 103(a) as being unpatentable over Masenten (U.S. patent No. 6,535,560). Applicants respectfully disagree with the Examiner and submit the following remarks in response.

The present invention as claimed in independent claim 20 is directed to a radio base station apparatus with an array antenna having a plurality of antenna elements for calibrating a phase difference among the array antenna elements.

In the present invention a probe signal adding unit divides one probe signal and then adds the divided probe signals to each receive signals received by the plurality of antenna elements. A probe data extracting unit extracts the probe data from the receive signals added with the probe signal. A phase calibration calculation unit calculates correlating phase calibration values required for calibrating a phase of each receive signal based on the probe data extracted by the probe signal extracting unit. A phase calibration unit calibrates a phase difference among the array antenna elements by

Application No. 10/674455
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calibrating the phase of the each receive signal based on the phase calibration from the phase calibration calculation unit.

Such an arrangement is an improvement over the prior art baseband processing circuit equipment. As noted in paragraph [0007] signals subjected to the array antenna controlling in the baseband must pass through various circuits and cables before transmission from the antenna. Accordingly, when the signal arrives at each antenna, deviation due to distortion is generated between signals arriving at respective antennas. Thus when there is deviation between signals arriving at respective antennas, it is impossible to transmit the signal with a desired radiation pattern.

A baseband processing circuit requires circuits for estimating level deviation and phase deviation generated in a radio frequency unit and cables and for compensating those deviations. When the cable length is large, it expands and contracts owing to variation in temperature, and accordingly, as a compensation circuit, use of an adaptive processing circuit is required.

The present invention as claimed relates to a probe signal that is applied to cables and a radio frequency unit, and an adaptive processing circuit uses this probe signal to perform the above-mentioned compensation. In particular *a probe signal adding unit divides one probe signal and then adds the divided probe signals to each receive signals received by the plurality of antenna elements*. See paragraphs [0026] and [0027]

Such a division of *one* probe signal, and the resulting divided probe signals being added to each of the receive signals, allows the calibration of the phase generated among the antennas and/or relative error of amplitude to be performed more easily. For

Application No. 10/674455
Amendment Dated September 12, 2006
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example, Equation 7 in paragraph [0039] is a calibration matrix for the relative calibration value.

The cited prior art, namely Masenten, teaches an adaptive calibration system and method using a reference signal where the reference signal is offset from a center frequency of the calibration signal so that the resultant product is offset from baseband by some small amount.

Adapting such as system to the array antenna of the present invention could possibly be performed by adding a plurality of such reference signals to each antenna, but such an arrangement would still suffer from drawbacks. Here an error is generated because a sender has to run a long cable when providing such a signal to each antenna. This error among probe antennas, in addition to already existing error generated between an array antenna and a cable which connects station apparatuses that are being calibration, may cause incorrect calibration.

As such, the Masenten reference does not teach or suggest the present invention as claimed. For example, there is no teaching or suggestion in Masenten that discloses a probe signal adding unit divides *one probe signal* and then adds the divided probe signals to each receive signals received by the plurality of antenna elements.

Applicants respectfully submit that the cited prior art does not teach or suggest all of the elements of independent claim 20 and request that the rejection be withdrawn. As claims 21-27 depend from claim 20, the rejections and objections to these claims should be withdrawn as well for the same reasons set forth above.

In view of the forgoing, Applicants respectfully submits that pending claims 20-27 of the present invention are in condition for allowance, the earliest possible notice of

Application No. 10/674455
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which is earnestly solicited. If the Examiner feels that an interview would facilitate the prosecution of this Application they are invited to contact the undersigned at the number listed below.

Respectfully submitted,

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By: 

9/12/06

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